⇒ OBSERVATION – subcategory of OBSERVED-POINT(An observation object. A report by a platform or by an instrument on a platform)
⇒ SENSOR – See subschema ATMOSPHERIC PLATFORM
⇒ STORMFIX – subcategory of OBSERVED-POINT (An atmospheric event of type stormfix. A stormfix is the position and time of an atmospheric event; for example, at the center of a storm, this is the location where the wind is = 0 at that point and time.)
⇒ ATMOSPHERIC-EVENT – category (A catalog of atmospheric events, e.g., storm Andrew, Dolly, etc.)
⇒ QUALITY-CONTROL – category (Observations undergo quality control. All determining actions (e.g., failed, passed, edited) constitute a quality control event.
⇒ OBSERVED-POINT – category (A catalog of coordinates for observations and stormfixes.)
⇒ when-utc – attribute of OBSERVED-POINT, range: Datetime, total "(Timestamp of an observed point).
⇒ latitude-degree – attribute of OBSERVED-POINT.
⇒ longitude-degree – attribute of OBSERVED-POINT.
⇒ pressure-mb -- attribute of OBSERVATION.
⇒ wind-speed-mps -- attribute of OBSERVATION.
⇒ name – attribute of ATMOSPHERIC-EVENT (A name given to a tropical system).
⇒ type – attribute of ATMOSPHERIC-EVENT, String (The tropical system name/identifier.)
⇒ when-utc – attribute of ANALYSES .
⇒ analysis-exposure-type – attribute of ANALYSES (An analysis for land or marine)
⇒ mode – attribute of ANALYSES (An analysis can be done at research or operational mode)
⇒ for – relation between OBSERVATION and ATMOSPHERIC-EVENT (m:m) (Many observations for many tropical systems)
⇒ for – relation between OBSERVATION and ATMOSPHERIC-EVENT (m:m) (Many stormfixes for many tropical systems)
⇒ participate-into – relation between OBSERVATION and ANALYSES (m:m) (Many observations participate into an analysis)
⇒ participate-into – relation between STORMFIX and ANALYSES (m:m) (Many stormfixes participate into an analysis)

6. PHYSICAL DESIGN - IMPLEMENTATION

In order to achieve functional equivalence between an aggregate schema database and its set of underlying databases, four basic tasks must be performed:

1. Mapping of aggregate schema names to underlying databases.
2. Maintenance of inter-database connections.
3. Maintenance of currency for the aggregate database.
4. Protecting the consistency of the aggregate databases.

We implemented the above in ORACLE 8, an object-relational database. We were able to map, in totality, WANDA semantic schema. This paper reports only part of the Observation subschema; Full presentation will be presented at the conference.

```
CREATE TYPE Atmospheric-event-t as OBJECT(
eventno                Number(10),
when-utc                Date,
eventname              V archar2 (30),
yr-event-no            Number (6),
landfall                Number,
type                   Varchar2 (30),
MAP MEMBER FUNCTION
 event_no RETURN NUMBER,
 PRAGMA RESTRICT_REFERENCES (
   event_no, WNDS, WNPS, RNPS, RNDS));
CREATE TABLE Atmospheric-event OFAtmospheric-event-t( PRIMARY KEY (EVENTNO));;
CREATE or REPLACE TYPE BODY atmosevent_t AS
MAP MEMBER FUNCTION event_no RETURN NUMBER IS
BEGIN
 RETURN EVENTNO;
END;
END;
CREATE TYPE  last_event_no_t as object(
lasteventno      NUMBER(10),
MAP MEMBER FUNCTION
 last_event_no RETURN NUMBER,
 PRAGMA RESTRICT_REFERENCES (
   last_event_no, WNDS, WNPS, RNPS, RNDS),
MEMBER FUNCTION
 new_event_no RETURN NUMBER,
 PRAGMA RESTRICT_REFERENCES (
   new_event_no, WNDS, WNPS) );
CREATE or REPLACE TYPE BODY last_event_no_t AS
MEMBER FUNCTION new_event_no RETURN NUMBER IS
tmp_no  NUMBER(10) := 0;
BEGIN
 tmp_no := lasteventno + 1;
 RETURN tmp_no;
END;
CREATE TYPE observed-date-t as OBJECt(
when-utc               date,
eventref               REFAtmospheric-event-t);
CREATE TABLE Observed-date of observed-date-t(
SCOPE FOR (eventref) IS atmospheric-event);
CREATE TYPE observed-point-t as OBJECT(
latitude-degree                Number(8,5),
longitude-degree               Number(8,5),
when-utc                       REF observed-date-t  );
CREATE TYPE analysis-t as Object(
when-utc                       date,
at-hour-minute                 Number(4),
exposure                       Varchar2(15)  );
CREATE TABLE analysis of analysis-t;

CREATE TYPE observation-t as OBJECT(
zonal-wind-mps          Number(8,5),
meridionall-wind-mps    Number(8,5),
temperature-c           Number (8,2),
relative-humidity-%     Number(8,2),
geopotential-ht-mps     Number (8,2),
points                  observed-point-t,
produced-by             REF sensor-t,
quality-control         Varchar2(10),
qc-when-utc             date,
participate-into        REF analysis-t,
MEMBER FUNCTION raw RETURN NUMBER
PRAGMA RESTRICT_REFERENCES (raw, WNDS, WNPS);
CREATE or REPLACE TYPE BODY AS
MEMBER FUNCTION edited RETURN NUMBER
PRAGMA RESTRICT_REFERENCES (edited, WNDS, WNPS),
MEMBER FUNCTION raw RETURN NUMBER IS
BEGIN
update observation
  set quality-control = 'Raw';
 RETURN 1;
END;
CREATE TABLE observation of observation-t( SCOPE FOR(produced-by )  IS SENSOR,
SCOPE FOR (participate-into) IS analysis);
```


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